WHAT IS CLAIMED IS:

1. A carbon black producing apparatus comprising a first reaction zone where an oxygen-containing gas and fuel are supplied into the reactor and burned to form a combustion gas flow, a second reaction zone disposed downstream of the first reaction zone and having a feedstock hydrocarbon feed port or ports for supplying a feedstock hydrocarbon to the combustion gas flow for reacting said hydrocarbon to produce carbon black, and a third reaction zone disposed downstream of the second reaction zone and designed so that the reaction will stop in this third reaction zone,

in the first reaction zone, the fuel feed port(s) and the oxygen-containing feed port(s) being provided independently spaced-apart from each other and being opened into the reactor from the same side thereof.

2. A carbon black producing apparatus according to Claim 1 having a choke in the second reaction zone.

3. A carbon black producing apparatus according to Claim 1 or 2 having an additional fuel feed port in each of the oxygen-containing gas feed ports.

4. A carbon black producing apparatus according to any one of Claims 1 to 3, wherein the shape of the oxygen-containing feed port opened into the reactor is non-circular.

5. A carbon black producing apparatus according to any one of Claims 1 to 4, wherein the shape of the oxygen-containing gas feed port is circular, and the opening diameter (Da) of the oxygen-containing gas feed port and the shortest distance (Dw) between the oxygen-containing gas feed port and the inner wall of the reactor have a relation of $Dw<1.5Da$.

6. A carbon black producing apparatus according to any one of Claims 1 to 4, wherein the shape of the oxygen-containing gas feed port is non-circular, and the opening diameter (DL) of the oxygen-containing gas feed port and the shortest distance (Dw) between the oxygen-containing gas feed port and the inner wall of the reactor have a relation of $Dw<1.5DL$.

7. A carbon black producing apparatus according to any one of Claims 1 to 6, wherein the distance from the crossing point of the center line of the fuel flow supplied from the fuel feed port and the center line of the oxygen-containing gas flow supplied from the oxygen-containing gas feed port to the end of the oxygen-containing gas feed port is not less than twice the opening diameter of the oxygen-containing gas feed port.

8. A method of producing carbon black comprising using a

producing apparatus as defined in any one of Claims 1 to 7.

9. A method of producing carbon black according to Claim 8, wherein the oxygen-containing gas flow rate is not less than 55 m/s.

10. A method of producing carbon black according to Claim 8 or 9, wherein the average temperature of the first reaction zone is not lower than 1,600℃.

11. A method of producing carbon black according to any one of Claims 8 to 10, wherein the combustion gas flow temperature in the vicinity of the feedstock hydrocarbon feed port is not lower than 1,600℃.

12. A method of producing carbon black according to any one of Claims 8 to 11, wherein the oxygen concentration in the vicinity of the feedstock hydrocarbon feed port is not more than 3%.

13. A method of producing carbon black comprising using a carbon black producing apparatus which comprises a first reaction zone where an oxygen-containing gas and fuel are supplied into the reactor and burned to form a combustion gas flow, a second reaction zone disposed downstream of the first reaction zone and having a feedstock hydrocarbon feed port or ports for supplying a feedstock hydrocarbon to the

combustion gas flow for reacting said hydrocarbon to produce carbon black, and a third reaction zone disposed downstream of the second reaction zone and designed so that the reaction will stop in this third reaction zone,

in the first reaction zone, the combustion gas flow being formed by high-temperature air combustion.

14. A method of producing carbon black according to Claim 13, wherein the average temperature of the first reaction zone is not lower than 1,600℃.

15. A method of producing carbon black according to Claim 13 or 14, wherein the combustion gas temperature in the vicinity of the feedstock hydrocarbon feed port is not lower than 1,600℃.

16. A method of producing carbon black according to any one of Claims 13 to 15, wherein the oxygen concentration in the vicinity of the feedstock hydrocarbon feed port is not more than 3%.

17. A method of producing carbon black comprising using a carbon black producing apparatus having a first reaction zone where fuel and an oxygen-containing gas are supplied into the reactor from a fuel feed port or ports and an oxygen-containing gas feed port or ports provided independently spaced-apart from each other to open into the

reactor, a second reaction zone disposed downstream of the first reaction zone and having a feedstock hydrocarbon feed port or ports for supplying a feedstock hydrocarbon to the combustion gas flow for reacting said hydrocarbon to produce carbon black, and a third reaction zone disposed downstream of the second reaction zone and designed so that the reaction will stop in this third reaction zone,

the average temperature of the first reaction zone is not lower than the ignition temperature of the fuel, and combustion being conducted while forming a recirculating flow between the oxygen-containing gas feed flow and the inner wall surface of the reactor.

18. A method of producing carbon black according to Claim 17 wherein in the first reaction zone, the fuel feed port(s) and the oxygen-containing gas feed port(s) are provided independently spaced-apart from each other and opened into the reactor from the same side thereof.

19. A method of producing carbon black according to Claim 17 or 18, wherein the reactor wall surface in the first reaction zone is under an oxidizing atmosphere.

20. A method of producing carbon black according to any one of Claims 17 to 19, wherein the average temperature of the first reaction zone is not lower than 1,600℃.

21. A method of producing carbon black according to any one of Claims 17 to 20, wherein the oxygen concentration in the vicinity of the feedstock hydrocarbon feed ports is not more than 3%.

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22. A furnace combustion apparatus having such constitution that: a fuel feed port or ports and an oxygen-containing gas feed port or ports are provided spaced-apart from each other and opened into the furnace from the same side thereof; (i) the shape of the oxygen-containing gas feed port(s) is non-circular or (ii) the opening diameter (DL) of the oxygen-containing gas feed port(s) and the shortest distance (Dw) between the oxygen-containing gas feed port and the inner wall of the reactor have the relation of $Dw<1.5DL$; fuel and oxygen-containing gas are supplied continuously; and the distance form the crossing point of the center line of the fuel flow supplied from the fuel feed port and the center line of the oxygen-containing gas flow supplied from the oxygen-containing gas feed port to the end of the oxygen-containing gas feed port is not less than twice the opening diameter of the oxygen-containing gas feed port.

23. A furnace combustion apparatus according to Claim 22 having an additional fuel feed port in each of the oxygen-containing feed ports.

24. A furnace combustion apparatus according to Claim 22 or 23, wherein the distance from the crossing point of the fuel flow and oxygen-containing gas flow to the end of the fuel feed port is not less than 30 times the opening diameter of the fuel feed port.

25. A furnace combustion apparatus according to any one of Claims 22 to 24, wherein at least part of the furnace inner wall is made of magnesia- or micromagnesia-based refractory material.

26. A furnace combustion method comprising using a furnace combustion apparatus as defined in any one of Claims 22 to 25.

27. A furnace combustion method comprising using a furnace combustion apparatus in which a fuel feed port or ports and an oxygen-containing gas feed port or ports are provided independently spaced-apart from each other and opened into the furnace from the same side thereof; fuel and oxygen-containing gas are supplied continuously; and the distance from the crossing point of the center line of the fuel flow supplied from the fuel feed port and the center line of the oxygen-containing gas flow supplied from the oxygen-containing gas feed port to the end of the oxygen-containing gas feed port is not less than twice the opening diameter of the oxygen-containing gas feed port,

the oxygen-containing gas flow rate being not less than 55 m/s.

28. A furnace combustion method using a furnace combustion apparatus in which a fuel feed port or ports and an oxygen-containing gas feed port or ports are provided independently spaced-apart from each other and opened into the furnace from the same side thereof; fuel and oxygen-containing gas are supplied continuously; and the distance from the crossing point of the center line of the fuel flow supplied from the fuel feed port and the center line of the oxygen-containing gas flow supplied from the oxygen-containing gas feed port to the end of the oxygen-containing gas feed port is not less than twice the opening diameter of the oxygen-containing feed port,

the average combustion temperature being not lower than 1,600℃.

29. A furnace combustion method according to any one of Claims 26 to 28, wherein the inner wall surface of the combustion furnace is under an oxidizing atmosphere.

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